## Declaration of Chris Liao

## Redacted Version of Document Sought to be Sealed

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18	UNITED STATES	S DISTRICT COURT
	NORTHERN DISTRICT OF CA	LIFORNIA, OAKLAND DIVISION
19	CHASOM DROWN at all individually	Com No. 4:20 are \$146 VCD SVIV
20	CHASOM BROWN, <i>et al.</i> individually and on behalf of all similarly situated,	Case No. 4:20-cv-5146-YGR-SVK
	D1-::	DECLARATION OF CHRIS LIAO RE:
21	Plaintiffs,	_
22	v.	
22	GOOGLE LLC,	The Honorable Susan van Keulen
23		
	Defendant.	
24		
25		
20		

Case No. 4:20-cv-03664-YGR-SVK

1	I, Huei-Hung "Chris" Liao, declare as follows:
2	1. I am currently a Software Engineer manager and lead for Ads Identity &
3	Infrastructure at Google and have been employed at Google for the past 10 years. In my role as a
4	manager and tech lead for Ads Identity & Infrastructure, I manage teams responsible for the
•	and other parts of Google's ads serving infrastructure. As a result of my
6	role and responsibilities, I am familiar with signals sent from a Chrome browser to Google in ad
7	requests, and am aware of a
	. Except where otherwise indicated, I make this declaration
9	based on my own personal knowledge and could competently testify thereto.
10	2. I received a litigation hold for this matter on December 2, 2020.
11	3. In March 2019, my team and I worked with a group of Chrome engineers to estimate
12	
	. A "signal" in this context means information sent from the browser for a dedicated
16	. A "signal" in this context means information sent from the browser for a dedicated purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to
16 17	
*******	purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to
17	purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to websites, including Google, for websites to properly render information.
17 18	purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to websites, including Google, for websites to properly render information.  4. I understand that the absence of a signal specific to Chrome's Incognito mode is
17 18 19	purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to websites, including Google, for websites to properly render information.  4. I understand that the absence of a signal specific to Chrome's Incognito mode is intentional; a key design principle for private browsing mode is that it should not be detectable to
17 18 19 20	purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to websites, including Google, for websites to properly render information.  4. I understand that the absence of a signal specific to Chrome's Incognito mode is intentional; a key design principle for private browsing mode is that it should not be detectable to the website being visited. See W3C TAG Observations on Private Browsing Modes (describing how
17 18 19 20 21	purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to websites, including Google, for websites to properly render information.  4. I understand that the absence of a signal specific to Chrome's Incognito mode is intentional; a key design principle for private browsing mode is that it should not be detectable to the website being visited. See W3C TAG Observations on Private Browsing Modes (describing how "browser vendors should work towards achieving private browsing mode" so that it is
17 18 19 20 21 22	purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to websites, including Google, for websites to properly render information.  4. I understand that the absence of a signal specific to Chrome's Incognito mode is intentional; a key design principle for private browsing mode is that it should not be detectable to the website being visited. See W3C TAG Observations on Private Browsing Modes (describing how "browser vendors should work towards achieving private browsing mode" so that it is "indistinguishable" from the "normal mode" to the sites being visited "to respect the user's privacy

DECLARATION OF CHRIS LIAO RE:

Case No. 4:20-cv-03664-YGR-SVK

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	In computer science, we sometimes refer to such an approximate method as a
5	"heuristic." I understood then, as I do now, that this method is not a reliable means to detect Chrome
6	Incognito traffic. This method is based on the fact that the X-Client-Data header is generally not
7	sent by browsers in Chrome's Incognito mode. However, there are two primary hurdles associated
8	with using the absence of this header to infer Incognito mode, which I discuss in turn below.
9	6. First, assuming one has accurately identified all Chrome traffic,
	Therefore, relying on the X-Client-Data header in Chrome traffic to indicate Incognito mode
12	will erroneously count traffic from non-Incognito sessions as traffic from Incognito sessions.
13	7. Second, this heuristic relies on being able to accurately identify all Chrome traffic
14	The X-Client-Data header is only sent from Chrome browsers; other browsers will not send an X-
15	Client-Data header. It is therefore necessary to isolate Chrome traffic from all of the other browser
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17	to determine whether a request came from a Chrome browser. Unfortunately, however, the user-
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19	traffic coming from browsers in which the user-agent has been altered to indicate it is coming from
20	a Chrome browser. Altering user-agent is not a theoretical concern. Apple's Safari browser has a
21	built-in feature that permits users to spoof a Chrome user-agent and there are Mozilla Firefox add-
22	ons that fulfill the same function.

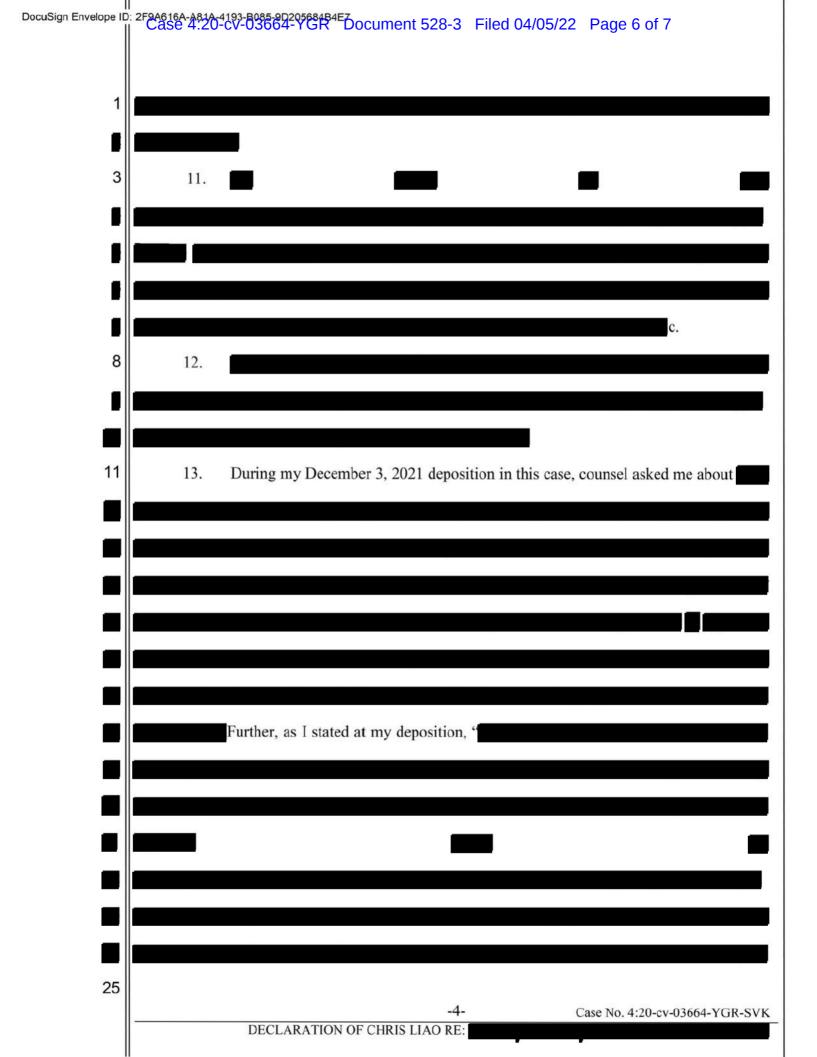
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8.

below arose because

The need for the approximation of Chrome Incognito mode through the method



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